Stable topological modes in two-dimensional Ginzburg-Landau models with trapping potentials

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Résumé en anglais	Complex Ginzburg-Landau (CGL) models of laser media (with cubic-quintic nonlinearity) do not contain an effective diffusion term, which makes all vortex solitons unstable in these models. Recently, it has been demonstrated that the addition of a two-dimensional periodic potential, which may be induced by a transverse grating in the laser cavity, to the CGL equation stabilizes compound (four-peak) vortices, but the most fundamental “crater-shaped” vortices (CSVs), alias vortex rings, which are essentially squeezed into a single cell of the potential, have not been found before in a stable form. In this work we report on families of stable compact CSVs with vorticity S=1 in the CGL model with the external potential of two different types: an axisymmetric parabolic trap and the periodic potential. In both cases, we identify a stability region for the CSVs and for the fundamental solitons (S=0). Those CSVs which are unstable in the axisymmetric potential break up into robust dipoles. All the vortices with S=2 are unstable, splitting into tripoles. Stability regions for the dipoles and tripoles are identified, too. The periodic potential cannot stabilize CSVs with S□2 either; instead, families of stable compact square-shaped quadrupoles are found.
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